

do not mention it, and I agree with Herr Haas that the story is a mere invention.

Of the arrival at Malacca some time in 1547 and of the subsequent conversion by Xavier of three Japanese there can be no doubt, however much we may distrust Pinto's account of his share in bringing about their visit. The chief of the three, Anjiro (Hachiro ?) induced Xavier himself to go to Japan, and in 1549 the great apostle of the east landed at Kagoshima, famous some three centuries later for its stout resistance to an English squadron.

Of Xavier's labours I can say little here. He remained two years and some months in Japan, founded three churches and baptized some 800 converts. Herr Haas speaks highly of his labours. But he seems to have been satisfied with mere external observances, and his ignorance of the language must have reduced his dogmatic teaching to its least expression. What would be interesting and instructive to know would be what the Japanese, especially the Buddhists and Confucianist scholars, thought of his doctrines. No hint has come down to us—perhaps they took no thought of a strange religion that seemed of no great importance. The chapters on the social and political conditions of Japan in the sixteenth century are interesting—particularly the account they give of Buddhism and Confucianism, both in themselves and as a setting to Xavier's apostolate.

Herr Haas's style is not unattractive, and in the eulogy of Xavier rises into eloquence. But—to an Englishman at least—many of the sentences, often occupying half a page or more, are both tedious and obscure. A portrait of Xavier taken from an old print is prefixed, which, however, bears little resemblance to that contained in Dr. Murray's "Japan." F. V. D.

#### CHEMICAL PHILOSOPHY.

*Le Mixte et la Combinaison Chimique: Essai sur l'Évolution d'une Idée.* By E. Duhem. Pp. 207. (Paris, 1902.) Price fr. 3.50.

FROM the earliest times there have existed two opposed views of the constitution of homogeneous mixtures. According to one view, the mixture was in reality as in appearance homogeneous. The elements composing it disappeared as such and were replaced by an entirely new thing, the mixture, from which, however, by appropriate treatment the original elements might be regenerated. According to the other view, the homogeneity was only apparent, and due to the feebleness of our senses. Each element consisted ultimately of atoms, which in the mixture retained their individual character, being mingled, but in no sense fused.

Prof. Duhem in the present essay, which originally appeared in the *Revue de Philosophie*, follows the fortunes and discusses the scientific evolution of these ideas from the time of Bacon and Descartes to the present day. In a series of interesting chapters, he shows the adaptation of chemical theory to facts as they accumulated, tracing the development of the notions of element, equivalent, substitution, type, valence, isomerism. It is, however, to the last chapters that chemists will probably turn with the greatest interest. In these the author gives a critique of the atomic theory and an account of

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chemical mechanics. His point of view may best be given by quotation.

The great achievement of atomic theory is the simple interpretation of the law of multiple proportions. But, the author asks, is the victory decisive? Who can say that this is the only possible explanation?

"When we see with what simplicity and clearness all the principles of modern chemistry may be systematically expounded, though the name and notion of atom are alike absent, and what difficulties and contradictions arise when it is desired to interpret these principles according to the doctrines of the atomists, we cannot help thinking that the sole success of the atomic theory is only an apparent victory and one without a future, that the theory does not show us the true objective basis of the law of multiple proportions, that this basis still remains to be discovered, and finally, in a word, that the evidence of modern chemistry is not in favour of the Epicurean doctrine."

In a foot-note, the author draws attention to the circumstance that what is here said of the law of multiple proportions and its interpretation by atomic hypotheses may be repeated word for word of the crystallographic law of rational indices and its interpretation either by the integrant molecules of Hauy or the space-nets of Bravais.

With regard to the general aspect of physics and chemistry to-day, the author says:—

"Physical science is not a metaphysic. It has no intention to penetrate beyond our perceptions in order to grasp the essence and ultimate nature of the objects of these perceptions. Its end is to construct by means of signs borrowed from the science of numbers and from geometry a symbolic representation of what our senses, aided by instruments, bring to our knowledge. Once constructed, this representation lends itself to reasoning more simply, rapidly and certainly than the purely experimental data for which it was substituted. By this artifice, physics assumes a breadth and precision which it could never have attained without clothing itself in this schematic garment which we call theoretical or mathematical physics. To each element which logical analysis discovers in any physical concept there now corresponds, not a metaphysical reality, but a geometrical or algebraic character of the symbol which is substituted for the concept. For the notion of a chemical substance, for example, there is substituted a chemical formula; the idea of the analogy of two chemical systems is expressed by a series of equalities between the indices which affect certain letters; the idea of derivation by substitution is represented by means of certain lines or 'bonds'; and the dissymmetry of a geometrical figure serves to represent a substance possessed of optical activity."

We can thoroughly recommend the book for the thoughtful consideration of those interested in chemical philosophy.

#### OUR BOOK SHELF.

*Die Internationalen absoluten Masse insbesondere die elektrischen Masse.* By Dr. A. von Waltenhofen. Third edition. Pp. xi + 306. (Brunswick : Friedrich Vieweg und Sohn, 1902.) Price 8 marks.

In preparing the third edition of this book, the author has, by introducing an amount of new matter, nearly equal to the whole of the second edition, sought to make the work, not only a complete study of the international system of units and measurement, and in particular of the electrical units, but also an introduction to the study of electrical

engineering (*Elettrotechnik*). In a work dealing with such a subject, we should have thought the publishers would not have departed from the very sensible plan, adopted in practically all good German scientific books, of printing in the ordinary Roman type instead of in the German script. We can safely assert that the adoption of the German character will very considerably reduce the number of foreign readers.

The book is divided into two parts, the first containing chapters on the mechanical, magnetic, electrostatic and electromagnetic units, and a comparison of these two latter systems.

The second part, taking up three-quarters of the book, is entitled "Additions and Explanations" (*Zusätze und Erläuterungen*), and consists of a somewhat curious collection of all kinds of information and numerical examples, and we are afraid that the reader who uses the book as an introduction to the study of electrical engineering will not profit very much thereby. We think, in fact, that the two objects of the book are incompatible, as it is hardly reasonable to expect a person just beginning to study electrotechnics to grasp such conceptions as the relations of the electromagnetic and electrostatic systems of electrical units, and so forth, or to go from chapter ii. of the second part, on the calculation of dynamos and considerations of the thickness of the insulation on double cotton-covered wires, &c., to chapter iii., introducing, without a word of warning, highly involved considerations of potential theory with differential equations half a page long.

The book will be mainly useful to teachers in technical colleges and schools, who are often called upon for the satisfaction of inquiring students to work out a formula from first principles, a subject with which the practical man has neither the time nor the inclination to bother. Such a teacher would find it useful to have this book by him, and the many references and footnotes given would be additionally helpful in such cases.

In fact, the book appears to us like a collection of notes of theoretical considerations and blackboard examples acquired by a lecturer to assist him in his lectures, and as such will no doubt have its sphere of usefulness.

If we may permit ourselves one more remark, in paragraph 92, on "hydroelectric chains," examples are worked out at length on the calculation of electromotive force according to the old "Thomson" law (equivalence of heat of reaction and electrical current work), and the only warning given that this assumption is both fundamentally wrong and in many cases leads to totally false results is given in a footnote. In a work on "absolute" units, this should hardly occur. The book is indexed very well, which is an additional advantage from the above-mentioned point of view.

C. C. G.

*Index-tabellen zum anthropometrischen Gebrauche.* By Carl M. Fürst. (Jena : Gustav Fischer, 1902.) Price 5 marks.

In the preparation of their great work "Anthropologia Suecica, Beiträge zur Anthropologie der Schweden," Drs. Gustaf Retzius and Carl M. Fürst had to deal with a vast mass of figures. It is the custom of physical anthropologists, not merely to publish their measurements, but also to give the ratio of a given measurement to another, and this is termed an "index"; for example, the ratio of the breadth of the head to its length is called the cephalic index, and is obtained by multiplying the breadth by one hundred and dividing the product by the length. The calculating of a large number of indices is undeniably a very tedious process, and various devices have been employed to save the student this clerical labour. Certain mechanical and other devices have been invented, but these have never proved satisfactory and are not employed by serious workers. The most accurate and practical rapid method of determining an index is by means of

tables which have been carefully computed. It is evident that such tables once constructed and published would materially lighten the labour of those who do this kind of work.

The first tables of this nature were published by Prof. Welcker in the *Archiv für Anthropologie* in 1868. They were calculated only for the cranial index, and even so were not of sufficient range. In 1879, Prof. Flower published some very useful and on the whole accurate tables in his well-known Osteological Catalogue of the Royal College of Surgeon's, London, Part i., Man. These were calculated for the various cranial indices which he employed in that valuable publication; though these tables have proved a great boon to workers, they are not sufficiently extensive to meet modern requirements. Of greater scope are the Broca's tables which were published by Bogdanow in the *Mittheil. d. kaiserl. Gesells. d. Naturwiss. anth., eth. Abtheil.* (Moscow, 1879.) These also had some clerical errors, and the size of the page rendered it somewhat unwieldy. This publication was very difficult to obtain, and as a matter of fact the tables were not generally used by anthropologists.

Now all this is changed, as Dr. Fürst has published his extensive tables in a convenient form and at a low price, and has placed at the disposal of his colleagues, in twenty-nine tables, the result of the enormous labour of Fräulein Ellen Anderson-Gülich, who has made the requisite calculations.

Anthropologists will find in these tables practically all the indices they are likely to require, but there are certain indices which have not been carried sufficiently far to include some of the more extreme measurements that can be made on the living subject of non-European peoples; this will affect but few investigators, and that only rarely. Our hearty thanks are due to Dr. Fürst.

*Jahrbuch der Chemie*, 1901. Herausgegeben von Richard Meyer. (Brunswick : F. Vieweg und Sohn.) Price 15 marks.

THE Jahrbuch for 1901 is the eleventh of the series and has for its object a review of the chemical work done during the year. Very few alterations are to be noted in comparison with the previous publications so far as arrangement and scope of the work are concerned. Several changes have, however, taken place on the editorial staff. In consequence of the death of Prof. Märcker, the chapters on agricultural chemistry, technology of the carbohydrates and brewing industries have been relegated respectively to Profs. Morgen, Herzfeld and Delbrück. Dr. W. Küster, of Tübingen, is now the editor of the section on physiological chemistry, and Prof. Doeltz, of Clausthal, of that on metallurgy.

The various authors appear to have given, on the whole, a satisfactory account of the research work carried out in their respective provinces, and the reader will obtain a good idea of what has been accomplished during the past year in both pure and applied chemistry. It seems doubtful, however, whether a compilation of this kind, in which nearly all the collaborators are of German nationality, gives the best possible account of the work of men of science in other countries. The greater part of the researches in pure chemistry carried out by English chemists is published in the *Transactions of the Chemical Society*. The editors of the various sections of the Jahrbuch apparently consider themselves in many cases capable of giving a clear and succinct account of these investigations by reference to the short notes in the *Proceedings of the Society*. It is unnecessary to point out the impossibility of such a mode of procedure being attended with any measure of success, and the practice must be strongly condemned.

It is to be hoped that, in future publications of the year book, greater care will be exercised in rendering an account of the work of English chemists. Its claims to